X-CIRCULAR POLARIZE MICROSTRIP PATCH ANTENNA

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Tajuk Projek : X-CIRCULAR POLARIZE MICROSTRIP PATCH ANTENNA

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DEDICATION

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ABSTRACT

In this thesis, a project of x-circular polarize microstrip patch antenna with resonant frequency at 2.4GHz with higher gain and directivity and circular polarization in x-form for ISM band application is presented. A design of X-Circular Polarize Microstrip Patch Antenna from type of circular slot patch antenna oriented at $\mathbf{45^0}$ and $\mathbf{-45^0}$. The antenna is capable to generate circular polarization in X form. Besides that, a design of x-circular polarize microstrip patch antenna to avoid loss caused by multipath effects which is antena required circular polarization. Design x-circular polarize microstrip patch antenna to avoid mispolarization happen from misalignment of transmitter and receiver antenna. First step is design and simulate x-circular polarize microstrip patch antenna using CST Microwave Studio software to obtain the return loss, bandwidth, radiation pattern, gain, directivity and surface current. In order to verify the results, the antenna is fabricated by using chemical etching process. After that, the return loss is measured by using *Advantest Network Analyzer* while gain and radiation pattern is measured by using *ME 1300 antenna training kit* and x-circular polarize microstrip patch antenna as a receiver and horn antenna as a transmitter antenna. The result obtain showed the return loss of the antenna is lower than -10**dB** at 2.4 GHz and produce higher gain and directivity. Furthermore, the polarization of antenna is x-circular polarization at **±45°** which also has acceptable gain.

ABSTRAK

Dalam thesis ini menceritakan tentang projek *X-circular polarize microstrip patch* antena dengan frekuensi 2.4GHz dan mempunyai gandaan dan keterarahan yang tinggi dan mempunyai *x-circular polarization* untuk di aplikasikan pada ISM band aplikasi. Antena ini berasal dari jenis *circular slot patch* antena yang di sengetkan pada sudut $+45^0$ dan -45^0 dan antenna mempunyai kebolehan untuk menjana polariti bulatan dalam bentuk x. Selain itu, antenna ini boleh menggelakkan kehilangan signal disebabkan efek *multipath* dimana antena memerlukan polariti bulatan untuk mengelakan kehilangan signal dari berlaku. Antara sebab rekaan antenna ini adalah untuk mengelakan *mispolarization* dari berlaku yang disebabkan daripada ketidaksamaan atau tidak sejajar antara antena penghantar dan penerima. Antena di design dan disimulasi mengunakan CST software untuk melihat kehilangan pembalikan, lebar jalur, polar sinaran, gandaan, keterarahan dan arus pada permukaan. Antena di fabrikasi menggunakan bahan untuk *etching* proses. Selepas itu, antena di ukur kehilangan pembalikan menggunakan *Advantest Network Analyzer* manakala gandaan, keterarahan dan polar sinaran di ukur menggunakan *ME 1300 antenna training kit* di mana antena yang direka sebagai menerima dan horn antena digunakan sebagai antena penghantar. Keputusan yang diberikan dimana kehilangan pembalikan bawah dari -10db pada frekuensi 2.4GHz dan mempunyai gandaan dan keterarahan yang besar.

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LIST OF ABBREVIATIONS

CST – Computer Simulation Technology

IEEE – Institute of Electrical and Electronics Engineers

E – Electric Field Vector

H – Magnetic Field Vector

P – Poynting Vector

PRef – Receiving power of a reference antenna

PTest – Receiving power of a test antenna

S – Scattering

RL – Return Loss

BW – Bandwidth

FNBW – First Null Beamwidth

HPBW – Half Power Beamwidth

εr – Dieletric constant

fr – Resonant Frequency

tan δ – Tangent Loss

h – Height of substrate

W – Width

L – Length

εreff – Effective dielectric constant

ΔL – Extended incremental length

Le – Effective length

Rin – Resonant input resistance

y_o – Inset feet-point distance

Z_o – Input impedance

FR-4 – Flame Resistant 4

ISM – Industrial Scientific and Medicine

Lf – Length of feedline

Wf – Width of feedline

AUT – Antenna Under Test

Tx – Transmitter

Rx – Receiver

$\ell\lambda/2$ – Length of feedline connected with the rectangular patch

LIST OF APPENDICES

CHAPTER I

PROJECT BACKGROUND

The project background consist of introduction, objetive, scope of work, problem statement and project methodology.

1.1 Introduction

The ISM radio band were for the use of radio frequency (RF) energy for industrial, scientific and medical purposes. The application in these bands such as Bluetooth and WLAN (wireless LAN) at 2.4GHz. The development of wireless communication system has been rapidly growth in this era with increasing demand in the level of enhancement and performance. A good antenna has high gain, small physical size, broad bandwidth and versatility. A microstrip patch antenna is one of the antennas that have the advantages such as light weight, small size, and low in cost, conformability and possibility of integration with active devices. The microstrip